

An observation most difficult to interpret is the absence of the red ground in series Z.

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## OVOVIVIPARITY AMONG MOLLUSKS

BY HENRY VAN DER SCHALIE

While working with a series of fresh-water shells from the Department of Peten in Guatemala it was found that two of the species, both new to science, namely, *Somatogyrus clenchi* and *Cochliopa francesca*, were ovoviviparous. This was particularly striking since, so far as could be determined, this phenomenon has never before been reported for any of the species belonging to the genus *Cochliopa*, and it is only the second time it has been found among species belonging to the genus *Somatogyrus*.<sup>1</sup> In checking through the literature it soon became obvious that, though there are a number of scattered records noting the occurrence of ovoviviparity, there are relatively few publications which deal with the subject in anything but a cursory way. Consequently, an attempt will be made to tabulate briefly such scattered information as was available in the hope that gradually we might arrive at a better understanding of the occurrence and probable significance of this phenomenon among the mollusks.

The lack of uniformity in the use of the terms oviparous, ovoviviparous, and viviparous is a matter of immediate concern. The confusion is somewhat justified since in nature we do not have a sharp separation between some of these processes, and there are cases where it would be difficult to apply any one of them consistently. Though in most instances what is meant is obvious, even when the terms are technically misapplied, it would be well if we first define these terms:

*Oviparous*: It is proposed that this term be applied to all cases where the eggs are extruded, whether they are fertilized externally or internally.

*Ovoviviparous*: This is to be applied to any group which hatches its young from the egg before expelling it. This term should obviously be applied in many instances where *viviparous* is used.

<sup>1</sup> Walker (1904, p. 140) found *Somatogyrus georgianus* to be ovoviviparous.

*Viviparous*: Though this term is almost universally used in cases where ovoviviparous is implied, it should obviously not be used where it applies to groups of the Mollusca. Its use should be restricted to cases (such as among the mammals) where there is a placental or immediate connection between the parent and its offspring.

Of the above three methods of reproduction, only the first two are found among the Mollusca. While most of the groups are oviparous, a surprisingly large number, representing a wide diversity of groups, are ovoviviparous. The Rev. A. H. Cooke (1895, p. 123) has listed a number of species which clearly show how unrestricted this phenomenon is. While it is true that whole groups, such as the *Viviparidae*, tend to be ovoviviparous, the following table will indicate how widespread this type of reproduction really is.

As to the significance of ovoviviparity among the Mollusca there has thus far been little more than conjecture. The general consensus of opinion, however, would indicate that in some instances, at least, the phenomenon represents an adjustment on the part of the organism to unfavorable environmental conditions, and that it consequently is decidedly advantageous to the species in terms of survival. In this connection, Taylor (1894-1900, p. 382) writes, "Certain groups, probably owing to special dangers to their offspring, have acquired the habit of retaining the ova within the body until the hatching has taken place, as in *Vivipara*, *Anodonta*, and certain species of *Pupa*, *Clausilia*, *Helix*, etc., the young being nourished by the secretions of the brood pouch, within which they may remain, as in the *Sphaeriidae*, until they are fully one-third the size of the parent shell."

Another interesting observation has been recorded by Pilsbry and Bequaert (1927, p. 252), "L. Raymond<sup>2</sup> apparently first observed that *Melanoides tuberculata* is viviparous. He stated that the young, newly laid snails spend the night inside the shell of the mother snail within a pouch of the neck of the animal. . . ."

Finally, Otto and Tönniges (1905, p. 415) in their study of the development of *Paludina vivipara* point out, in discussing the

<sup>2</sup> Raymond, L. 1852. Recherches anatomo-physiologiques sur les mollusques de l'Algerie, Journ. de Conchyl., III, pp. 325-329.

young in the uterus in August, that "those forms farthest developed are extruded, while those remaining winter over in the uterus. This maintenance of the young in the body of the mother is an advantageous adjustment, which protects the embryos against injuries, such as drying, and consequently promotes geographic distribution." Van Cleave and Lederer (1932, p. 509), working with *Viviparus contectoides*, essentially substantiate what Otto and Tönniges have reported regarding the wintering-over of certain young in the uterus of the parent.

A few of the genera and species ascertained to be ovoviparous are listed here, from a superficial glance through the literature.

#### *Land snails*

Cepolidae: *Oreohelix* (of the typical group). Sagdidae: "*Microphysa vortex*."

Clausiliidae: *Balea*; *Clausilia ventricosa*. Subulinidae: *Obo-liscus*; *Caeliaxis*. Achatinidae: *Limicolaria smithi*, *Achatina crawfordi*. Valloniidae: *Zoogenetes harpa*, *Pyramidula rupes-tris*. Vertiginidae: *Pupilla muscorum*, *Lauria cylindracea*. Paryphantidae: *Rhytida inaequalis*.

#### *Freshwater mollusks*

Melaniidae: *Melanoides lateritia*, *M. riquetii*, *M. tuberculata*; *Hemisinus*. Viviparidae, all genera. Hydrobiidae: *Somato-gyrus clenchi*, *S. georgianus*; *Cochliopa francesae*. Naiades. Sphaeriidae.

#### *Marine mollusks*

Volutidae: *Cymbium*. Littorinidae: *Littorina littoralis*. Tur-ritellidae: *Turritella cumberlandia*, *T. indenta*.

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## OXYSTYLA UNDATA UNDATA IN FLORIDA

BY H. A. PILSBRY AND C. N. GRIMSHAW

This genus of tree snails has up to this time been known in Florida by two species, *Oxystyla undata reses* (Say) and *O. floridensis* (Pils.). The first was described by Thomas Say from a specimen presented by "Mr. Elliott of Charleston" who stated that "it inhabits trees on the south part of Florida." It is now known from the larger keys of the lower group: Key West, Stock Island, Sugar Loaf, Boca Chica, Big Pine, Little Pine, Grassy Key, but we have not seen it from the intervening Key Vaca. In 1907 the senior author collected the largest specimen yet recorded, 61.5 mm. long, on Boca Chica Key. It is commonly about 45 to 52 mm. long.

In November, 1934, one of us (C. N. Grimshawe), found a colony of *Oxystyla* in hardwood hammocks quite a distance inland on Key Vaca. They were recognized as a new form, differing from *reses*, the ordinary form of the Keys. A series of these shells sent the senior author for examination confirms this conclusion, but a comparison with *O. undata undata* (Brug.) from Trinidad and from the Bahamas (New Providence and Andros),